

## A new taxon in the Mourning Wheatear *Oenanthe lugens* complex

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**SUMMARY.**—We describe a new taxon in the Mourning Wheatear *Oenanthe lugens* complex, from the basalt desert of eastern Jordan and southern Syria. This population has been almost universally considered to represent a melanistic colour morph of nominate *O. lugens*, but it also differs from any other member of the complex in lacking rufous undertail-coverts. It further differs from *O. l. lugens* in rump pattern and morphometrics. ‘Morph’ status is inappropriate, because the population is geographically restricted, whereas colour morphs are typically evident throughout the distributional range of a taxon. Suggestions that mixed pairings of pale- and black-morph birds occur are refuted by recent evidence. The new taxon has the wing formula and white wing panel of the *lugens* complex, but is closest in these respects to *O. l. persica*, whereas the largely black plumage makes it virtually identical to male Variable Wheatears *O. picata opistholeuca*. Because mtDNA analysis suggests that the new taxon is inseparable from *O. l. lugens*, we describe it at subspecies level. Remarks concerning distribution and conservation are presented, along with considerations for future research.

The Mourning Wheatear *Oenanthe lugens* complex has traditionally been considered to comprise eight, mainly sedentary subspecies (Ripley 1964, Collar 2005), as follows: (1) *O. l. lugens* (M. H. C. Lichtenstein, 1823) in the Levant south to north-west Saudi Arabia, eastern Egypt and north-east Sudan; (2) *O. l. halophila* (Tristram, 1859) in North Africa roughly from Libya as far as Morocco; (3) *O. l. persica* (Seebohm, 1881) in southern and western Iran, wintering mostly in eastern Arabia; (4) *O. l. lugentoides* (Seebohm, 1881) in the highlands of south-west Saudi Arabia and western Yemen; (5) *O. l. boscaweni* G. L. Bates, 1937, in north-east Yemen and southern Oman; (6) *O. l. lugubris* (Rüppell, 1837) in the highlands of Eritrea and north and central Ethiopia, (7) *O. l. vauriei* R. Meinertzhagen, 1949, in north-east Somalia; and *O. l. schalowi* (G. A. Fischer & Reichenow, 1884), in southern Kenya and north-east Tanzania, at the southern limits of the complex.

These taxa fall into three or four groups, some of which are increasingly separated as species (e.g., Porter *et al.* 1996, Panov 2005, Svensson *et al.* 2009, Jennings 2010), namely *O. lugens* (including *halophila* and *persica*; Mourning Wheatear, with the former sometimes separated as Maghreb Wheatear *O. halophila*), *O. lugentoides* (including *boscaweni*; South Arabian Wheatear), *O. lugubris* (including *vauriei*; Abyssinian Black Wheatear) and *O. schalowi* (Schalow’s Wheatear), with the latter two frequently ‘lumped’. Some authors have gone further. For example, Porter & Aspinall (2010) recognised *O. l. lugens* and *O. l. persica* at species level, under the vernacular name Eastern Mourning Wheatear, but Förschler *et al.* (2010) published molecular data to support splitting *persica* off from *lugens*. The latter study, the only published genetic data to date, recommended treating four species-level groupings, *O. lugens*, *O. persica*, *O. lugentoides* and *O. lugubris*. Nonetheless, some authorities have maintained a single species (e.g., Collar 2005), whilst others recognise only a two-way split (Zimmerman *et al.* 1996, Dickinson 2003) between those forms in North Africa and the Middle East, and those in East Africa.

One unresolved issue is the status of the population inhabiting the basalt deserts of north-east Jordan and southern Syria, as well as perhaps adjacent north-west Saudi Arabia



Figures 1–2. First-summer male Basalt Wheatear *Oenanthe lugens warriae*, showing the nearly all-black plumage, with white undertail-coverts, small white rump patch and basal tail feathers, between Azraq and Ar Ruwayshid, Jordan, April 2000 (Hadoram Shirihai); aged and sexed by combination of juvenile-retained remiges and primary-coverts (only tiny white spots remain on their tips due to wear, but these are still diagnostic), and highly glossed black plumage.



(see Tye 1994, Jennings 2010), which has been more or less universally treated as a black 'morph' of nominate *lugens*. Although two specimens (both in the Natural History Museum, Tring) have been available for many decades, it was only in the 1960s that the presence of a virtually all-dark *Oenanthe* population in this region was realised by J. Ferguson-Lees and D. I. M. Wallace (see Nelson 1973, Wallace 1983). They, along with subsequent observers such as Macfarlane (1978) and Clarke (1981), attributed their observations to *O. picata opistholeuca*. Only with the simultaneous publication of Tye (1994) and Andrews (1994) was it accepted that this population represented a black morph of *O. lugens*, although L. Cornwallis in Cramp (1988) had already suggested that the typical wing pattern of *O. l. lugens* found in these birds was evidence of their true affinity.

This interpretation has stood largely unchallenged until now, with the exception of brief remarks in van der Vliet & Lange (1997), whilst Khoury *et al.* (2010) suggested that the basalt desert population of *O. lugens* might warrant 'independent taxonomic status from the typical morph of *lugens*'. However, a molecular study (using the 16S and *cox1* mitochondrial genes) published concurrently to Khoury *et al.* (2010) by some of the same team suggested that the basalt population 'is best treated as a colour morph of the subspecies *O. lugens lugens*, since our genetic data ... reveals no difference', and that 'its colouration might be regarded as a morphological adaptation to the local conditions in the black-basalt shield' (Förschler *et al.* 2010: 764–765).

HS's interest in this population began on his first visit to Tring in 1985, when he found that the 'black wheatear' of eastern Jordan belonged with *lugens* and not *picata*, based on wing formula and that the female specimen held there was quite unlike that of the sexually dimorphic *O. p. opistholeuca*. The interest has continued during preparations for a monograph on the *Oenanthe* (Shirihai *et al.* in prep.), and together with the late A. J. Helbig, HS visited its breeding range in April 2000 and 2001, taking blood samples and making detailed observations. They became convinced that the basalt population merited taxonomic recognition, despite finding very low mitochondrial genetic divergence from *lugens*, but these findings went unpublished due to AJH's sudden death in October 2005. Although research into the basalt population is still ongoing, by ourselves, and others, we believe that the arguments for its taxonomic recognition are sufficiently powerful to describe it as:

### *Oenanthe lugens warriiae*, subsp. nov., Shirihai & Kirwan Basalt Wheatear

**Holotype.**—Natural History Museum, Tring (BMNH 1947.14.214); first-year female collected by W. K. Bigger at 'Aneizeh, Transjordan', on 9 November 1926, and originally labelled '*Oenanthe leucopyga*' by the collector. Tye (1994) speculated that this locality is modern-day Jabal Aneiza (Unayzah) on the border between Jordan, Iraq and Saudi Arabia, at 32°15'N, 39°15'E; we have no reason to doubt this, despite lying outwith the known breeding range (I. J. Andrews in Tye 1994), especially given that other evidence demonstrates

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Figure 3. Basalt Wheatear *Oenanthe lugens warriiae*, in its characteristic basalt desert habitat, where it frequents wadi sides with more open soil cover, larger and variably-shaped rocks, and sometimes low bluffs, between Azraq and Ar Ruwayshid, Jordan, April 2000 (Hadoram Shirihai)

Figure 4. Habitat of Basalt Wheatear *Oenanthe lugens warriiae*, the desolate rolling boulder fields (often broken by low bluffs or road cuttings with boulder piles—as in the background here), between Azraq and Ar Ruwayshid, Jordan, April 2000 (Hadoram Shirihai)

Figure 5. Basalt Wheatear *Oenanthe lugens warriiae* shares its habitat with another endemic passerine taxon, the darkest subspecies of Desert Lark *Ammomanes deserti annae*, between Azraq and Ar Ruwayshid, Jordan, April 2000 (Hadoram Shirihai)

the new taxon's capacity to appear outside the breeding range (see below). Label data: ovary small (annotated separately as being 'non-existent'); bill and legs black; irides dark brown; stomach contents seeds. Measurements of the holotype, other specimens and live birds of the new taxon appear in Table 1. Examination of feather wear and moult pattern (primary-coverts juvenile-retained) suggest that the holotype is a first-winter (Figs. 6–7).

**Other specimens.**—Another specimen of *O. l. warriac* is also held at BMNH, a presumed young female (short wing, overall browner hue to the black feathers, and reduced white in the remiges) from the Gould collection (BMNH 1881.5.1.933), which lacks a date and is labelled simply 'Egypt'. Because of the lack of good-quality locality or other data associated with this specimen, we refrain from assigning it paratype status. As noted by Tye (1994), Gould's localities are not always correct, but *warriac* has recently been photographed in Egypt (S. Baha El Din *in* Demey 2011), and this taxon may regularly disperse some distance (see below). Three additional specimens, of which two were described by Andrews (1994), are present in two Jordanian museums, but they have not been examined by us and are not assigned paratype status here. Nevertheless, we included measurements from the two birds detailed by Andrews (1994) in our analysis (Table 1) and studied photographs of one of them in Andrews (1994).

**Additional material examined / field work.**—We examined specimens of the entire *O. lugeus* complex (*halophila*, *lugeus*, *warriac*, *persica*, *lugentoides*, *boscaweni*, *lugubris*, *vauriei* and *schalowi*) at BMNH and the American Museum of Natural History (AMNH; New York). In particular, we studied variation in nominate *lugeus* and *persica* at BMNH (see Table 1), but HS also studied 32 specimens mostly assigned to nominate *lugeus* and which could be aged and sexed, in Tel Aviv University Zoological Museum. We have studied the following taxa in the field: *halophila* (GMK, in Morocco), *lugeus* (GMK & HS, in Israel), *warriac* (HS in Jordan), *lugentoides* (GMK, in Yemen), *boscaweni* (GMK, in Oman and Yemen), *lugubris* (HS, in Ethiopia) and *schalowi* (HS, in Tanzania). Detailed field observations of *warriac* in Jordan involved 12 birds in 2000 and 17 in 2001, in the basalt desert roughly between Safawi and Ar Ruwayshid. To better understand individual (and age / sex) variation, especially the development of the white remiges pattern in nominate *lugeus* dedicated field work was conducted in Israel's Negev Desert in October 2011. Forty-two individuals were observed, of which 11 were photographed in the field and 12 in the hand.

**Description of holotype.**—Colour names and numbers follow Smithe (1975). Between Colors 119 (Sepia) and 82 (Blackish Neutral Gray) over the head, neck, mantle, scapulars, upper back, and throat to lower belly, including the thighs, with bluish sheen that is strongest on the upperparts (none of the *O. l. lugeus* examined show this as strongly or as extensively; at most slightly on scapulars and lesser coverts). Wings between Colors 119A (Hair Brown) and 219 (Sepia), but the longest and shortest tertials are new, adult-like, and approach the colour of the rest of the upperparts. Greater coverts closest to Color 219 (Sepia). Subterminal tail band and r1 same colour as the wings, but r2 on the right side of the tail and rr3–5 on the left side are new, adult-like and approach the rest of the upperparts in colour. White tips to the retained juvenile primary-coverts. Very narrow whitish-grey bases on the inner webs of the primaries, with very steep penetration to the bases of these feathers. First primary (p1) relatively short (about equal to the primary-coverts) and all dark greyish on the underside (all nominate *O. lugeus* invariably have 25–75% of the inner web bright white at the base or the tip). Adult males of *warriac* also have the underside of p1 grey. Underwing-coverts as body, contrasting with the rest of the underwing, which is off-white. Emargination on pp3–5, and shallowly and short on p6. Rest of plumage (rump, uppertail-coverts and remainder of tail) is white; the undertail-coverts are essentially also white, but some feathers are partially washed pale sandy-cream (visible in certain light / angles).

TABLE 1

Measurements of *Oenanthe* wheatears, principally specimens (held at the Natural History Museum, Tring, unless specified otherwise) but also two live birds trapped in Jordan by HS & AJH. All specimens measured by HS & N. Cleere, except two at the Jordan Museum of Natural History (Yarmouk Univ., Irbid) from Andrews (1994). Wing = flattened chord; tail-band = subterminal area of black, measured along shaft of outermost rectrix from below; rump patch = area of white on rump / uppertail-coverts, measured from below furthest extent of black on lower back (where border between them is solid) to longest white uppertail-coverts; and all other measurements based on standard protocols of Svensson (1992). All specimens sexed and aged by the authors, but only sex is shown, as morphometrics of *Oenanthe* do not differ with age (HS pers. obs.). For remarks concerning the sex / age of the 'Egypt' specimen of *O. l. warrianae* see the main text. Figures below each sex class show mean (in bold) plus range (in parentheses) and standard deviation (±). We could not determine to which taxon the two Syrian specimens belong (see Further research), but have treated them separately. No mean or range is shown as only one specimen of each sex was available.

sex	skin reg. no.	date	locality	Wing	tail	tail-band	tarsus	hindclaw	bill to skull	bill to feathers	depth at rear nostrils	rump patch	$P \propto PI$	$P1 < P2$	$P2 =$	emargination
<b><i>O. l. lugens</i> — Egypt, Israel, Palestine and Jordan</b>																
male	1924.3.17.28	4 Apr. 1923	25 miles E of Cairo	92.5	62	7	27.1	6	18	14.5	4	48	3.3	47.5	p5/6	no
male	1879.4.5	18 Jan. 1864	Masaba	95	62	9	26.2	6.4	19.3	13.2		49	5.5	46.5	p5/6	no
male	1965.M.12114	2 Apr. 1919	Jordan Valley	96	62.5	11	27	7.5	19.7	14	4.2	49	5.8	47	p5/6	no
male	1926.1.5.1	25 Nov. 1922	Jericho—Jerusalem road	94	66	9	24.5	5.1	19.9	13	4.2	49	4.4	44.3	p5/6	no
male	1934.1.1.4251	no date	Palestine	92	61	9	25.8	6.4	19.7	13		43	1.9	43.8	p5/6	no
male	1919.7.20.90	11 Nov. 1918	Palestine	95	63	9	26.3	6.5	19.5	13.5	4.4	48	5.2	44.7	p5/6	no
male	1919.7.20.91	12 Mar. 1919	Palestine	94	61	10	26.7	6.4	20	14.1	4	43	3.4	44.9	p5/6	no
male	1864.11.22.12	no date	no locality	95	63		27.2	6.6	18.8	13.2	4.4	50	3.2	45.4	p5/6	no
male	1946.63.55	9 Nov. 1944	NW Dead Sea	95	65	11	25.5	6.4	18.3	12.3	4.9	48	6	44.7	p5/6	no
male	1965.M.12113	8 Mar. 1923	Jericho—Jerusalem road	92	58	12	26.7	6.1	18.7	13.5	4.6	51	2.4	43	p5/6	no
male	1898.9.1.2273	13 Jan. 1864	Masaba	91	56	10	25	6.8	19.1	12.3			4.1	41.7	p5/6	no
male	1965.M.12112	8 Mar. 1923	Jericho—Jerusalem road	92.5	60	13	26.9	7.1	20.4	14	4.8	48	4.8	42.4	p5	no
male	1945.31.27	18 Mar. 1922	SE of Jerusalem	89	59	11.5	27.3	6.5	19	14.1	4.4	42	4.3	44	p5/6	no
male	1946.63.54	4 Nov. 1944	NW Dead Sea	91	60	9	25.3	6.8	19.6	13.6	4.8	43	5.1	43.5	p5/6	no
<b>n=14</b>				<b>93.14</b>	<b>61.32</b>	<b>10.03</b>	<b>26.25</b>	<b>6.47</b>	<b>19.28</b>	<b>13.45</b>	<b>4.15</b>	<b>46.83</b>	<b>4.24</b>	<b>44.52</b>		
				(89–96)	(56–66)	(7–13)	(24.5–27.3)	(5.1–7.5)	(18.0–20.4)	(12.3–14.5)	(4.0–4.9)	(42–51)	(1.9–6.0)	(41.7–47.5)		
				sd = 2.023	sd = 2.657	sd = 1.613	sd = 0.895	sd = 0.551	sd = 0.675	sd = 0.665	sd = 0.316	sd = 3.157	sd = 1.261	sd = 1.677		

sex	skin reg. no.	date	locality	wing	tail	tail-band	tarsus	hindclaw	bill to skull	bill to feathers	depth at rear nos-tills	rump patch	$P < P_1$	$P_1 < P_2$	$P_2 =$	emargination
female	1926.9.20.25	16 Sep. 1925	Jericho	87	56	11	25.8	7.5	19.2	12.4	4.6	52	4.3	40.5	p5/6	no
female	1947.14.204	12 Nov. 1921	Jericho	91	60	8	26.3		18.7	12.8	4.6	43	1.8	44.2	p5/6	very shallow
female	1965.M.12117	8 Mar. 1923	Jericho-Jerusalem road	92	62	8	26	6.6	19	12.9	4.4	49	3	48.7	p5/6	no
female	1919.7.20.93	2 Apr. 1919	Palestine	90	60	14	26.1	6.7	18.8	12.2	4.4		4	46	p5	shallow
female	1879.4.5	30 Dec. 1865	Palestine	85	55	11	24.7	6.4	19.2	13.1	4.5	45	5.2	40.8	p5/6	no
female	1965.M.12118	8 Mar. 1923	Jericho-Jerusalem road	90.5	64	14	25.5	5.8	18.8	13.2	4.2		6.4	41.5	p6	no
female	1919.7.20.92	23 Mar. 1918	Palestine	91.8	60	14.5	24.8	5.5	18.2	14	4.3		2.2	45.5	p5/6	no
female	1965.M.12120	12 Mar. 1923	Petra, Jordan	87.5	57	9	25.6	7.2	19.5	13.3	4.4	45	4.9	41.2	p5/6	no
<i>n</i> =8				89.35	59.25	11.18	25.6	6.52	18.92	12.98	4.43	46.8	3.97	43.55		
				(85-92)	(55-64)	(8.0-14.5)	(24.7-26.1)	(5.5-7.5)	(18.2-19.5)	(12.2-14.0)	(4.2-4.6)	(43-52)	(1.8-6.4)	(40.5-48.7)		
				sd = 2.545	sd = 3.058	sd = 2.724	sd = 0.585	sd = 0.711	sd = 0.395	sd = 0.559	sd = 0.138	sd = 3.633	sd = 1.566	sd = 3.008		

*O. l. warriar*—'Egypt' and Jordan

male	live bird trapped	4 Apr. 2000	north-east Jordan (c.32°13'N, 37°12'E)	97	64.5	18	26.5		18.5				-0.5	49	p5/6	no
male	677 (Jordan Natural History Museum)	27 Jan. 1985	Safawi, Jordan	99	65	19	27		18.5							
male	678 (Jordan Natural History Museum)	27 Jan. 1985	Safawi, Jordan	99	65	19	27		18.5							
<i>n</i> =3				98.33	64.83	18.66	26.83		18.5				n/a	n/a		
				(97-99)	(64.5-65.0)	(18-19)	(26.5-27.0)									
				sd = 1.154	sd = 0.288	sd = 0.577	sd = 0.288									
female	live bird trapped	4 Apr. 2000	north-east Jordan (c.32°13'N, 37°12'E)	92.5	62.5	14.9	25.5		18				-0.5	47	p5/6	no

sex	skin reg. no.	date	locality	Wing	tail	tail-band	tarsus	hindclaw	bill to skull	bill to feathers	depth at rear nostrils	rump patch	$p < p_1$	$p_1 < p_2$	$p_2 =$	emargination	
female	1947.14.214 BMNH	9 Nov. 1926	Aneizeh, Transjordan	92	62	16	25.2	5.6	19.5	13.3	4.4	30	0.5	46.2	p5/6	shallow	
female?	1881.5.1.933 BMNH	no date	Egypt'	92	65	15	26.3	6.5	18.1	12.3	4.3	35	1.8	47.7	p5/6	no	
n=3				92.16 (92.0-92.5)	63.16 (62-65)	15.3 (14.9-16.0)	25.66 (25.2-26.3)	6.05 (5.6-6.5)	18.53 (18.0-19.5)	12.8 (12.3-13.3)	4.35 (4.3-4.4)	32.5 (30-35)	0.6 (-0.5-1.8)	46.96 (46.2-47.7)			
				sd = 0.288	sd = 1.607	sd = 0.608	sd = 0.568	SD = 0.636	sd = 0.838	sd = 0.707	sd = 0.071	sd = 3.535	sd = 1.153	sd = 0.750			
<b>Subspecies unknown — Syria (see text)</b>																	
male	1946.63.56	19 Dec. 1944	Ras Baalbec, Anti-Lebanon, Syria	95	61	12	23.4	6.7	18.7	12.2	4.6	46	1.8	49.6	p5/6	no	
female	1905.10.11.18	24 Mar. 1905	Karyatein, Syria	92	62	15	25.5	6.4	17.6	11.9	4.6	45	2.2	44.6	p5/6	no	
n=2																	
<b><i>O. l. persica</i> — wintering birds in Arabia and Egypt</b>																	
male	1965-M12130	25 Jan. 1948	Birka, Saudi Arabia	96	64	17.6	25.9	5.9	20.4	13.4	4.2	37	4.2	47.1	p5/6	6	
male	1935.1.5.177	10 Nov. 1934	Riyadh, Saudi Arabia	97	64	22	25.8	5.6	20.6	13.5	4.4	46.2	2.1	47.5	p5/6	none	
male	1965.M.12127	5 Feb. 1951	Hofuf, Hasa, Saudi Arabia	95	66	22	27.3	5.6	20.3	13	4.1	45.8	2.5	46.3	p6	none	
male	1965.M.12129	29 Jan. 1948	Ashaira, Saudi Arabia	98	65	21	25.9	6.5	19.1	13.6	4.2	35.8	1.7	48.9	p5/6	6	
male	1975.10.161	12 Feb. 1971	Jebel Al-Dukhan, Bahrain	94	63	17	25.5	5.4	18.3	13	4.5	42.8	-2	48.2	p6	none	
male	1934.9.20.242	4 Feb. 1934	Jeddah, Saudi Arabia	96	65	17	26.5	5.3	19.3	13.1	4.4	43.5	3.6	46.5	p5/6	none	
male	1965.M.12123	11 Nov. 1918	Talaat-Ed-Dum, Jordan Valley	89	60	15	25.1	6.6	19.	13.7	4.4	31.8	2.9	42.1	p5/6	6	
male	1935.1.5.179	12 Nov. 1934	Jubaila, Riyadh, Saudi Arabia	94.5	62	16	23.1	6.3	20	13.8	4.1	44.4	0	47.1	p6	6	
male	1935.1.5.180	13 Nov. 1934	Jubaila, Riyadh, Saudi Arabia	98	65	15	24.9	6	19.4	13.7	4.3	42	6.6	45.4	p5/6	none	
male	1934.9.20.247	13 Feb. 1934	Jubaila, Riyadh, Saudi Arabia	95	65	16	23.5	6.7	19.2	12.6	4.1	42.7	4.8	43.6	p6	none	



sex	skin reg. no.	date	locality	wing	tail	tail-band	tarsus	hindclaw	bill to skull	bill to feathers	depth at rear nostrils	rump patch	$P < P_1$	$P_1 < P_2$	$P_2 =$	emargination
male	1895.5.1.568	26 Feb. 1868	Egypt	95	64	15	24.6	5.6	18.6	12.5	4.3	49.6	1.6	46.9	p5/6	none
male	1936.6.29.37	9 Jan. 1936	Hadda, Wadi Fatima, Saudi Arabia	91.5	59.5	17	26.3	5.3	18	11.9	4.4	42.3	2.3	44.6	p5/6	none
<i>n</i> =12				94.91 (89-98)	63.54 (59.5-65.0)	16.71 (15-22)	25.36 (23.1-27.3)	5.9 (5.3-6.7)	19.35 (18.0-20.6)	13.15 (11.9-13.8)	4.29 (4.1-4.5)	41.99 (31.8-49.6)	2.52 (-2.0-6.6)	46.18 (42.1-48.9)		
				sd = 2.583	sd = 2.061	sd = 2.641	sd = 1.212	sd = 0.513	sd = 0.836	sd = 0.583	sd = 0.144	sd = 4.922	sd = 2.225	sd = 1.953		
female	1937.4.17.349	24 Nov. 1936	Upper Habauna & Najran District, Saudi Arabia	88	59.5	15	24.3	6	18	14.6	4.2	35	3.5	43	p5/6	6
female	1934.9.20.241	27 Jan. 1934	Jeddah, Saudi Arabia	91	60	18	22.9	4	18.6	13.5	4.1	39	4	42	p5/6	6
female	1934.9.20.243	29 Jan. 1934	Wadi Fatima, Saudi Arabia	98	64	16	35.6	6	19	14.5	4.7		3	47	p5/6	6
female	1934.9.20.244	31 Jan. 1934	Jenin, Mecca, Saudi Arabia	90.5	60	18	24.4	6	18.7	15	4.3	30	3	43	p5/6	none
female	1934.9.20.248	27 Feb. 1934	Jeddah, Saudi Arabia	90	60.5	16	25	7	17.2	14.6	4.3	21	2	43	p5/6	none
female	1935.1.5.181	14 Nov. 1934	Jabal Pukham, Saudi Arabia	90.5	57	16	26.1	6	18.8	14.8	4.2	32	3.5	41	p5/6	none
female	1965.M.12122	21 Feb. 1928	Kosseir (= Quseir), Egypt	90	62	16	26	6	18.2	13.7	4.1	38	3	42	p5/6	none
female	1965.M.12126	21 Jan. 1951	Bahrain	91	58	19	21	4	17.8	14.1	4.4	35	2	44	p5/6	none
female	1965.M.12125	19 Jan. 1951	Bahrain	97	64	18	25.2	5	18.5	14.3	4.2	44	4	48	p5/6	none
female	1965.M.12128	1 Feb. 1951	Hofuf, Hasa, Saudi Arabia	94	59	18	25.4	6	18.7	14.6	4.1	45	3	44	p5/6	6
female	1965.M.12131	6 Feb. 1948	Sail Kebir, Saudi Arabia	94	61	18	23.6	6	18.3	15	4.6	40	4	45	p5/6	none
<i>n</i> =11				92.18 (88-98)	60.45 (57-64)	17.18 (15-19)	25.4 (21.0-35.6)	5.63 (4-7)	18.34 (17.2-19.0)	14.42 (13.5-15.0)	4.29 (4.1-4.7)	35.9 (21-45)	3.0 (2.0-4.0)	43.81 (41-48)		
				sd = 3.148	sd = 2.218	sd = 1.300	sd = 3.689	sd = 0.924	sd = 0.522	sd = 0.490	sd = 0.202	sd = 7.093	sd = 0.716	sd = 2.136		



Figures 6–7. Holotype of Basalt Wheatear *Oenanthe lugens warriae* (BMNH 1947.14.214; the top bird in both figures) compared to Mourning Wheatear *Oenanthe l. lugens* (bottom; BMNH 1926.9.20.25, Jericho) (Hadoram Shirihai / © Natural History Museum, Tring). The holotype was originally misidentified as White-crowned Wheatear *O. leucopyga* by the collector, subsequently assigned to Variable (Eastern Pied) Wheatear *O. picata opistholeuca*, and only in 1985 realised to be most closely related to *O. lugens*. These images show its unique characters, especially the black underparts, the lack of any peachy rufous colour on the undertail-coverts, the all-black head, small white rump, and the relatively broad subterminal tail-band.

**Diagnosis.**—Readily distinguished from the rest of the *O. lugens* complex by the lack of any deep buff, peachy to pale orange-rufous coloration on the undertail-coverts, which feature characterises all of the other taxa mentioned above. The undertail-coverts are essentially white or dusky white, but often tinged sandy cream or grey, apparently due to discoloration by the local soil. Nevertheless, even in such birds, this sandy hue is never extensive or as contrastingly peachy orange as in *O. l. lugens*. The almost completely black plumage, without any pale feathers on the crown, nape or underparts, provides a further obvious distinction from the rest of the complex. Further, the amount and pattern of white in the remiges are an important taxonomic distinction across the *lugens* complex. The pattern of white in *warriae* is very different from that in all ages of nominate *lugens*, and only superficially closer to *persica* (Appendices 1–2). Despite the limited sample for *warriae* compared to *O. l. lugens*, the geographically most proximate taxon, morphometric differences appear rather significant, namely the longer wing and tail (*c.*5% longer and virtually no overlap in males: Table 1) but shorter bill (*c.*2.5% with extensive overlap), and the distinctly smaller white rump / uppertail-coverts patch but broader black subterminal band (in both latter 30–40% differences and no overlap with *O. l. lugens*). These last two features are significant in *Oenanthe* taxonomy, playing major roles in display / territory signalling. The much shorter distance between the primary-coverts and first primary (p1, the outermost), but considerably longer distance between p1 and p2, provide further means of separation, at least in the hand, and some of these mensural characters also apply *vis-à-vis* other populations of *O. lugens sensu lato*. See Table 1 and Figs. 6–9.

Morphometric data, both those published here and those recently presented by Förschler *et al.* (2010: 764), suggest that *warriae* is closest to *O. l. persica*, and a detailed study of the ecomorphology of *warriae*, like that conducted by Kaboli *et al.* (2007) for many other wheatears, might prove interesting. *O. l. warriae* to some extent approaches North African *O. l. halophila* in that males of the latter have reduced white in the remiges and paler buffish undertail-coverts. Moreover, *warriae* has a small white rump like males of the southern Arabian *O. lugentoides* (adult males also share a rather similar white pattern in the primaries, and both taxa have dusky-coloured juvenile plumages); the molecular relationship of these two has not been compared, *cf.* Förschler *et al.* (2010). *O. l. warriae* and *lugentoides* broadly occupy the northern and southern ends of the Arabian Plate, respectively, while their



Figure 8. Tail pattern of Basalt Wheatear *Oenanthe lugens warriac* from above, between Azraq and Ar Ruwayshid, Jordan, April 2000 (Hadoram Shirihai)

Figure 9. Tail patterns of Basalt Wheatear *Oenanthe lugens warriac* (left-hand bird: BMNH 1947.14.214) and *O. l. lugens* (BMNH 1926.9.20.25, at right) from below. Basalt Wheatear has the broader black tail-band, as well as mostly white (not rufous) undertail-coverts, but sometimes partially tinged sandy cream (like here), dusky white or greyish on some feathers (Hadoram Shirihai / © Natural History Museum, Tring)

white rump and remiges patterns closely recall *O. lugubris* of the East African Rift Valley. However, within the context of *O. lugens sensu lato*, *halophila*, *lugentoides* and *lugubris* are all sexually dimorphic. *O. l. warriac* is intermediate between the monomorphic and truly dimorphic taxa in the complex, especially in wing pattern compared to *O. l. lugens*, and with experience most birds can be sexed if correctly aged (see Appendix 1). Further, Khoury *et al.* (2010) also found that *warriac* has a distinctive dark juvenile plumage. The longer, more pointed wings of *warriac* suggest that it undertakes substantial post-breeding dispersal, which corresponds with records in south-east Turkey, south Israel (for both see Distribution, habitat and conservation), and Egypt (see above). This dispersal resembles *persica*, but is unlike nominate *lugens*, which disperses only short distances, including altitudinally (Shirihai 1996, Khoury *et al.* 2010).

In the field, separation of *O. l. warriac* from male Variable Wheatear *O. picata opistholeuca* (which is often relegated to morph status in the literature; see discussion under Taxonomic rank) is extremely difficult. Both BMNH specimens were formerly treated as this taxon, until Tye (1994) elucidated their true identity. However, *contra* Tye (1994), both specimens are young females, aged and sexed by the combination of spotty white (juvenile-retained) primary-covert tips, the less intense black plumage (even slightly brownish-tinged in the Egyptian specimen) and especially the very limited greyish white on the inner webs of the remiges. They thus hardly differ from male *opistholeuca* in wing pattern. Adult *warriac*, especially males, possess more white on the inner webs of the remiges (almost comparable to *persica*: cf. Figs. 10–11 vs. Fig. 18) than in any male *opistholeuca*. However, the pale panel is hardly visible in flight in young birds, especially females (e.g. Figs. 13, 14 and 16), being much like *opistholeuca*, meaning that separation must focus on structural characters. And *vice versa*, male *opistholeuca* can be excluded using this feature only if compared to an adult male *warriac*. Any vagrant *warriac* or male *opistholeuca* will require full documentation with photographs and, preferably, an in-the-hand examination of the wing (see below).

In general, *opistholeuca* has a proportionately longer tail, affording it a slimmer appearance than *warriac*, broader spacing between the primaries, and the wingtip (pp3–4) usually shows only four obvious primary tips beyond the bunched secondaries, with a notably shorter distance between them and p7. In Basalt Wheatear, however, usually five closely spaced primary tips are visible (apart from the wingtip), and the distance between p7 and the secondaries is wider. These differences appear consistent and are the best means

to separate the two taxa, but only if the birds' plumage is not heavily worn or in moult. A supporting character is the tail-band, averaging slightly broader in *warriae* and more even on both webs of r6, but in *opistholeuca* narrower and tends to be less even, with dark on the outer webs averaging longer still, forming a pattern recalling Pied Wheatear *O. pleschanka* or Black-eared Wheatear *O. hispanica*. Due to its shorter tail and longer wings, in Basalt Wheatear the distance between the wingtip and the proximal edge of the tail-band is usually shorter. The plumages of the two taxa, in general, are surprisingly similar, but *warriae* tends to have the black lower belly more clearly demarcated from the white undertail-coverts, whereas in *opistholeuca* the border is more diffuse, with more white feathers admixed and usually reaches the undertail-coverts at the sides, leaving a paler central area; however, there is overlap due to individual variation. The juvenile primary-coverts of *warriae*, like all *O. lugens sensu lato*, possess broader whitish tips (bolder and concentrated on the tips of the inner webs) with indistinct narrow fringes to the outer webs, which with wear become a line of spots (again, more distinct on the inner webs). In young male *opistholeuca* the tips / fringes are more even, extend further along the edge on the outer webs and do not form a spotted pattern with wear (cf. Figs. 2 and 19 of *warriae* vs. Fig. 21 of male *opistholeuca*). On landing, *opistholeuca* frequently engages in deep bobbing, whereas such behaviour is infrequent and less obvious in *O. lugens*, but individual variation probably renders this of limited use. In the hand, *warriae* can be separated by wing formula:  $p2 = p5/6$ , with emarginated pp3–5 (none or very indistinct on p6); in *opistholeuca*  $p2 = p6$  or  $6/7$ , with emarginated pp3–6 (the vast majority have clearly emarginated p6, but in some this is rather indistinct; Shirihai & Svensson in press). Further, in *warriae* the p1 falls about level with the tips of the primary-coverts ( $p1 > pc$ , mean 0.6 mm; Table 1), whereas in *opistholeuca* it usually is much longer ( $p1 > pc$  2.5–7.5 mm, mean 4.9 mm; Shirihai & Svensson in press, Shirihai *et al.* in prep), which sometimes can even be detected in the field (compare Figs. 20 and 21).

Separation of *warriae* from White-crowned Wheatear *O. leucopyga*, which also occurs in eastern Jordan, to where it has apparently spread recently (Andrews *et al.* 1999, Khoury *et al.* 2010), is easier, even for individuals that are wholly or largely black-crowned (mostly first-years), using tail pattern, as in *leucopyga* it is almost always only / mostly the central rectrices that are black. Very rarely *leucopyga* develops a complete, inverted black T shape pattern on the tail, like *opistholeuca* and *warriae*, but remains diagnostically strongly glossed and is a larger bird. The geographically distant Black Wheatear *O. leucura* (Iberia and north-west Africa) is also difficult to separate from *opistholeuca* and *warriae*, but is distinctly larger and more heavily built, and its wing structure very different, especially the considerably shorter primary projection but longer p1 (Shirihai & Svensson in press). With hindsight, the lack of knowledge of Basalt Wheatear has caused it to be misidentified as all the above taxa, including the type specimen and the first two Israeli records (see p. 286).

No published analysis of vocalisations is available, although HS noted, during his observations in 2000–01, that the song of *O. l. warriae* is more complex, overall lower pitched, albeit with higher warbling sounds admixed, and lacks some of the deep fluting notes of *O. l. lugens*. These conclusions require more detailed study that should include the undescribed vocalisations of *O. l. persica*. Colour illustrations or photographs of the new taxon appear in a number of works, notably Andrews (1994, 1995: Plate 27), van der Vliet & Lange (1997), Andrews *et al.* (1999: 29; a leucistic bird), Boon (2004: 230), Collar (2005: Plate 80), Balmer & Murdoch (2009: 218), Svensson *et al.* (2009), Khoury *et al.* (2010) and Porter & Aspinall (2010: 311).

**Distribution, habitat and conservation.**—As a breeder *O. l. warriae* is found almost exclusively in the basalt deserts of eastern Jordan and southern Syria (Fig. 22). Its range reaches as far south and west as the near environs of Azraq, Shaumari and Umari in Jordan (Clarke 1981, Andrews 1994), perhaps east to Jabal Aneiza on the border between Jordan,



Figures 10–15. Age and sex variation in Basalt Wheatear *Oenanthe lugens warriac*, between Azraq and Ar Ruwayshid, Jordan, April 2000 (Hadoram Shirihai). Left three images (Figs. 10–12) of an adult male and right three images of a first-summer female (Figs. 13–15) (measurements of these birds are in Table 1). Note the blacker-blue gloss to the adult male, which can be aged by the lack of any strong moult contrast in the wing, the strongly textured and uniformly black adult remiges, primary-coverts and tail, whilst the primary-coverts lack any white tips. The young female is less glossed and somewhat browner on the dark areas, with worn and bleached, juvenile-retained remiges and primary-coverts; the latter also possess white spots on their tips. The adult male has broader and purer white inner webs, visible on both surfaces, which are either reduced or lacking in the young female. The white on the inner webs does not reach the shafts, but does reach the base of the feathers, while the first primary is very short, and the broad black tail-band makes *warriac* closer in morphology to *O. l. persica* than to the geographically proximate *O. l. lugens*. These and other plumage features, especially overall coloration, make this taxon virtually identical to male Variable Wheatear *O. picata opistholeuca*, especially first-summer female *warriac* which lack, or almost lack, the white upperwing panel. Only two diagnostic characters separate first-summer female *warriac* from male *opistholeuca*: the more pointed wingtip and longer primary projection with more evenly spaced primary tips and one extra visible primary, and the spotty white tips to the post-juvenile primary-coverts in Basalt Wheatear.



Legends to plate on p. 283

Figure 16. First-summer male Basalt Wheatear *Oenanthe lugens warriae*, southern Syria, February 2009 (Nicolas Martinez): note combination of worn, browner primaries, forming moult contrast with the secondary-coverts, and juvenile-retained primary-coverts with still some, very tiny, whitish tips, as well as blacker-blue gloss to the dark feathers. The lack of visible white on the inner webs of the remiges (even on the stretched wing) confirms that it is a young bird, and thus cannot be separated using this feature from male Variable Wheatear *O. picata opistholeuca*. Compare with adult male *warriae* (Fig. 10) which has visible white on the inner webs of the remiges.

Figure 17. Mourning Wheatear *Oenanthe l. lugens*, southern Israel, July 2008 (Amir Ben Dov). Nominate race cannot be sexed (male-like plumage occurs in females), but the uniform adult remiges, primary-coverts and tail age this bird as an adult (that has just ended its annual complete post-breeding moult). Note that unlike both *O. l. warriae* and *O. l. persica*, the white on the inner webs of the remiges reaches the shafts.

Figure 18. Mourning Wheatear with *Oenanthe lugens persica*-like characters, Palmyra, southern Syria, February 2009 (Nicolas Martinez). Note especially the *persica*-like narrow white patches on the inner webs of the remiges that do not reach the shafts, and the broad black tail-band. The latter makes *O. l. persica* and *warriae* closer in morphology to each other, than to *O. l. lugens*. Note also the evenly feathered wing (especially the lack of juvenile-retained primary-coverts), which confirms the bird is an adult and that the regimes pattern is not that of a young *lugens*. Because *O. l. persica* is migratory, such birds could have been wintering away from their usual winter range.

Iraq and Saudi Arabia (Tye 1994; see holotype), although its main range in Jordan probably reaches no further east than around Ar Ruwayshid. In the north and east it enters Syria as far at least as Jabal Sis (33°18'N, 37°22'E), south-east of Damascus (Macfarlane 1978, Baumgart *et al.* 1995). Further north, in the central Syrian desert, around Palmyra (34°33.196'N, 38°17.15'E), only more typically plumaged Mourning Wheatears are present (Serra *et al.* 2005), though see below. Its Jordanian range was mapped in Andrews (1994, 1995).

Although the ex-Gould collection specimen labelled 'Egypt' cannot be taken alone as proof that *O. l. warriae* performs longer-distance dispersal, there is another, far more recent claim (not yet assessed by the Egyptian records committee), a bird photographed at Shalatein, on 2 December 2010 (*cf.* Demey 2011). Records also exist from Israel, in December 1982 (E. Doverat), February 1986 (HS) (these two records were misidentified as Black and Variable Wheatears, respectively; Shirihai in prep.), December 1994 (Shirihai 1996), December 2004 (J. P. Smith & Y. Perlman: Fig. 19) and January 2010 (U. Makover) and, even more remarkably, one in south-east Turkey apparently nesting with a female Finsch's Wheatear *O. finschii* in spring 2011. In this context, a recent molecular study uncovered evidence of a close relationship between *O. finschii* and *O. lugens* (Aliabadian *et al.* 2007). Most observers resident in Jordan and Syria for longer periods have suggested the existence of short-range movements in the post-breeding season (e.g., Macfarlane 1978, Khoury *et al.* 2010). None of these extralimital records should be taken as evidence for *warriae* being a morph. Its long wing further hints at the possibility of regular migratory movements, and all confirmed records away from the basalt desert to date have involved young birds. The recent Turkish record is the only evidence of *warriae* breeding away from a clearly circumscribed geographical region, and then only as a hybrid pairing with *O. finschii* and outside of the range of the *O. lugens* complex.

Concerning habitat, *O. l. warriae* is apparently restricted to outcrops of Al Harra basalt flows (Andrews 1994: 34), but is 'generally absent from the featureless, rolling, boulder fields', being most frequently seen in areas of 'road cuttings, boulder piles and abandoned telegraph poles in addition to natural bluffs and the sides of wadis' (Andrews 1994: 34; see also Figs. 3–4). Mean annual precipitation here is just 50–250 mm, and the wheatears prefer hills and escarpments with steep slopes and high rock cover for breeding, but visit more level ground to forage, including the sides of tarmac roads (Khoury *et al.* 2010). They share the basalt desert with another unusually dark taxon, the Desert Lark *Ammomanes deserti annae* R. Meinertzhagen, 1923 (Fig. 5). The current status of *O. l. warriae* in Syria is



Figure 19. First-winter male Basalt Wheatear *Oenanthe lugens warriae*, Arava Valley, southern Israel, December 2001 (Yoav Perlman), showing the white undertail-coverts and the diagnostic white-spotted juvenile-retained primary-coverts and alula (only tiny white spots remain on their tips due to wear, but they are still fundamentally bold and concentrated on the tips to the inner webs).

Figure 20. First-summer male Basalt Wheatear *Oenanthe lugens warriae*, southern Syria, February 2009 (Nicolas Martinez). Some young *warriae* could lose (through wear) the diagnostic white-spotted juvenile-retained primary-coverts and alula rather earlier in the spring. Such birds could be misidentified as adults, but note the clear moult limits between the juvenile-retained (brownish) and post-juvenile renewed (blackish) greater coverts. They could be more easily confused as male Variable Wheatear *O. picata opistholeuca* (due to the lack of white in the remiges and white primary-covert spots).

Figure 21. First-summer male Variable Wheatear *Oenanthe picata opistholeuca*, Feyzabad, north-east Afghanistan, May 2010 (Frank Joisten), showing how this taxon has virtually identical plumage to Basalt Wheatear *O. lugens warriae*. This bird is aged and sexed by combination of its juvenile-retained remiges and primary-coverts, and the black coloration to the dark plumage tracts. Compared to *warriae* it can be separated by the proportionately shorter primary projection (fewer exposed primary tips) but relatively longer tail and narrow black tail-band (distance between the latter and the wingtip much longer than in *warriae*, although this can be reliably judged only in profile and certain stances). Also unlike *warriae*, p1 is longer than the primary-coverts, which if visible could be a critical field mark. Note the overall jizz is more Pied Wheatear *O. pleschanka*-like in *opistholeuca* than in *warriae*, which is more compact and less long-tailed looking. This male *opistholeuca* has some remnants of the pale tips to the primary-coverts, but these are diffuse and on the outer webs, rather than bold tips concentrated on the inner webs, as in *warriae*.

very poorly known, but recent field work in north-east Jordan suggests that it is very rare, perhaps even on the verge of extinction there, possibly as a result of recent droughts and through competition with *O. leucopyga*, which has recently colonised this region (Khoury *et al.* 2010). By formally naming the Basalt Wheatear, even at the rank of subspecies, our hope is that conservation bodies will take greater interest in this unusual bird.

**Etymology.**—It gives HS & GMK great pleasure to name this *Oenanthe* for Mrs Frances E. ('Effie') Warr, former Librarian at BMNH, and long-time stalwart of the Council of the Ornithological Society of the Middle East. This association makes the naming of the new taxon in her honour especially appropriate. Over many years, she has provided innumerable ornithologists with countless courtesies. She is one of the unsung, backroom heroes of modern ornithology. The specific name *warriae* is a noun in the genitive case formed under Art. 31.1.1 of the ICZN (1999) Code, wherein the name Warr is Latinised. As regards its vernacular name, Basalt Wheatear has been in widespread 'unofficial' use for well over a decade, and we advocate its retention.

No previous name is available for the basalt population. Although Förschler *et al.* (2010) alluded to it as '*basalti*', this name is a *nomen nudum* because its initial use cannot be considered a valid nomenclatural act according to the *International code of zoological nomenclature* as, for example, no type specimen was nominated and no type description published (ICZN 1999, Arts. 13.1.1, 16.1, 16.4 and 72.3). We searched extensively for a previous name that might be applicable to this population, commencing with the synonymy of various *Oenanthe* taxa in Seebohm (1881) and including those names applied by the early German explorers of the Middle East and north-east Africa. Most interestingly, the type



of *Oenanthe leucura syenitica* (Heuglin, 1869), actually represents a taxon from the *lugens* complex and has similar features to *warriae*. However, all of the morphological evidence points to it being a different taxon (e.g., overall size, wing formula, tail-band width), especially as it was collected in June in either Egypt or Sudan.

**Taxonomic rank.**—Unlike Förschler *et al.* (2010) and Khoury *et al.* (2010), who were apparently in ‘two minds’ as to whether taxonomic status for the basalt population was warranted, we believe that it clearly is. Its position is unique. Morphometrically, this form groups with *O. l. persica*, a taxon ranked as species by Förschler *et al.* (2010). Yet clearly it cannot be considered a colour morph of the latter, especially given its genetically near-identical profile to *O. l. lugens*. Moreover, treating the basalt population as a colour morph is dubious given that it is both geographically circumscribed and lacks a morphological character found in all other populations of *O. lugens sensu lato*, i.e. the rufous-tinged undertail-coverts, unlike the black morph of *O. lugubris*, in which the undertail-coverts maintain the distinctive coloration (polymorphism in this taxon went unrecognised until the work of Vaurie 1949: 27–28).

Here, *O. l. warriae* is conservatively treated as a subspecies under a modern interpretation of the Biological Species Concept (e.g., Helbig *et al.* 2002), although we note that its plumage, mensural and other characters might, in combination, be sufficient to accord it species rank under the guidelines recently developed by Tobias *et al.* (2010; see Appendix 3). Analogously, Ticehurst (1922), Haffer (1986) and Panov (1992, 2005) rejected the concept that the three plumage types in *O. picata* represented colour morphs as espoused, for example, by Vaurie (1949), Ripley (1964), Cramp (1988), Collar (2005) and others, instead considering them to be valid taxa, a view that we find persuasive. That *O. l. warriae* is a colour morph of *O. lugens* is unlikely because this nearly all-black form is geographically restricted as a breeder to the basalt deserts of north-east Jordan and southern Syria (Andrews 1994, 1995), and intermediates or mixed pairs with *O. lugens* have not been observed to date (Andrews 1994). Tye claimed broad overlap and the existence of mixed pairings, but he lacked relevant field experience. Moreover, the unique characters of the basalt form appear to be stable, most importantly the lack of rufous on the undertail-coverts, judged by all published observations. Observers with experience of *O. l. warriae* have found little evidence of overlap and none of hybridisation, with typical-plumaged Mourning Wheatears and Basalt Wheatears apparently selecting different substrates (Andrews 1994, Khoury *et al.* 2010; HS & AJH pers. obs.). Khoury *et al.* (2010) found that juvenile plumage is also unique (although their sample size is not stated), providing further strong indication of the taxonomic validity of *O. l. warriae*. However, both our own unpublished genetic data and those of Förschler *et al.* (2010) indicate that variation in the *O. l. lugens* / *O. l. warriae* clade is just 0.2–0.3% in mtDNA and they are not diagnosable using barcoding methods. Thus we prefer to await further molecular and vocal data, and to test the potential biological significance of, for example, the very small white rump patch of *O. l. warriae*, before considering whether species-level separation might be warranted. Nonetheless, it might be mentioned that Randler *et al.* (2011) found that the *O. hispanica-melanouleuca-cypriaca-pleschanka* complex is also genetically ‘uniform’, offering a potential parallel with the *warriae* / *lugens* situation. Randler *et al.* (2011) maintained species status for *O. cypriaca*, despite lack of genetic differences. It seems that in *Oenanthe*, morphometrics, plumage characters and vocalisations (using well-controlled playback experiments) are of even greater import for determining species status than molecules.

Finally, the close genetic relationship of Basalt Wheatear to *O. l. lugens* further confirms that it is not a disjunct population of *O. picata opisthroleuca* and, as described above, despite virtual identical plumage the latter differs clearly in measurements and wing formula from *O. l. warriae*.

Given the obvious plumage and some biometric differences, but the lack of genetic differentiation between *warriae* and other members of the *lugens* complex, their 'split' is presumably rather contemporary and presumably rests on natural selection favouring a darker form in the basalt desert. However, especially fascinating is how *O. l. warriae* has developed virtually identical plumage to male *O. p. opistholeuca*. Finally, the entire genus *Oenanthe* requires additional genetic analysis, as many relationships remain unresolved, including between several very well-differentiated species / groups.

**Future research.**—Major handbooks (e.g., Vaurie 1959, Cramp 1988) suggest that Syria is inhabited by *O. l. lugens*, and that it is a very widespread breeder there. However, available material of Mourning Wheatears from Syria is too limited to determine which taxon breeds there. For example, at BMNH there are just two specimens from Syria—both assigned to 'nominate' *lugens* (1946.63.56 and 1905.10.11.18)—but these proved impossible to assign to subspecies using morphometrics (Table 1). Both are first-years with juvenile-retained remiges and their *persica*-like white pattern on the primaries is inconclusive for identification (see *O. l. lugens*, Appendix 2), while in biometrics they either approach one or other subspecies, or appear intermediate. We also examined photographs of live birds from Syria, mostly from Palmyra, which seem to possess typical *O. l. persica* characters, but these were mostly taken in winter (e.g., Fig. 18). Because *O. l. persica* is migratory, such Syrian records (dated December–March) could have been wintering away from their usual range in eastern Arabia. HS recently found several winter specimens showing classic *O. l. persica* characters collected in southern Sinai, Egypt and southern Israel (Tel Aviv University Zoological Museum; including three adult males, 9718, 9624 and 2296). This suggests that *O. l. persica*-like birds occur regularly at least as far as west as the Levant in winter. It remains to be elucidated which taxon breeds over much of Syria. Should field work prove that most or all breeders are *persica*-like, this would suggest one of three possibilities: (1) that *persica* breeds much further west than currently thought, (2) the presence of a variable and perhaps intermediate population between *lugens* and *persica*, or (3) an undescribed taxon in Syria. The origin of *persica*-like birds recorded wintering within the range of the nominate in Sinai, Egypt and Israel is unresolved. This is particularly interesting with respect to *O. l. warriae*, whose morphometrics and tail pattern are closer to *persica*. Field research is required to resolve this issue. For now, it appears premature to adopt the 'borderline split' of *persica* (1.2–2.2% divergence in mtDNA from nominate; Förschler *et al.* 2010) until the identification of *persica*-like birds in Syria is resolved, and their relationship to *persica* breeding in Iran, as well as to *O. l. lugens* and *O. l. warriae*, have been more fully investigated employing molecular, vocal and additional morphological data.

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### Appendix 1: ageing and sexing Basalt Wheatear

We analysed all available *O. l. warriae* specimens or photographs, as well as trapped birds (see Table 1) and found that *warriae* shows clearer sexual differences than *O. l. lugens*. At least some can be reliably sexed if correctly aged first (by moult and feather wear / wing pattern, and pattern of the primary-coverts), combined with general plumage pigmentation, amount of white on the inner webs of the remiges (especially the primaries) and some biometrics (Table 1). *O. l. warriae* seems to undergo a complete post-nuptial moult (adults), while juveniles undertake a partial post-juvenile moult, in late summer / early autumn. Post-juvenile renewal includes the entire head, body, lesser and median coverts, most or all greater coverts, and usually some tertials and alula feathers; replacement of some rectrices appears irregular. Pre-nuptial moult seems absent or limited, though some spring birds have very fresh secondary-coverts and tertials that had apparently been renewed recently. Plumage and seasonal variation is as follows: **SPRING Adult** Generally less worn, or quite fresh until April, especially the primaries which are also blacker. Wings also lack any obvious moult limits or any other vestiges of immaturity (*cf.* first-summer). Adult ♀ has black areas generally duller, less strongly glossed metallic blue and purple as in adult ♂, and extent of white or pale grey in remiges reduced (adult ♂ has clear-cut and purer white on the inner webs—Figs. 10–11). **First-summer** Aged by more worn, browner, retained juvenile remiges, and primary-coverts, most of which usually still show the diagnostic small white tips, at least until April. Both sexes correspondingly less intensely glossed, with black areas especially of young ♀♀ even browner. Juvenile remiges have reduced white or pale grey, and especially young ♀♀ lack any visible white on inner webs of open upper wing (Figs. 13–14). Some first-summer ♂♂ also lack visible white on the spread upper wing, but most have some visible, even approaching that in adult ♀. **AUTUMN Adult** Evenly very fresh wings without discernible moult limits; primary tips fresh or, at most, slightly worn, and primary-coverts only slightly worn, blacker and glossier, and lack bold white tips of first-winters. Plumage and amount of white on inner webs to remiges generally as spring adults. **First-winter** (Fig. 19) Similar to adult, but has diagnostic bold white tips to primary-coverts, while those with retained juvenile alula and tertials also have contrasting bold white tips (reduced with wear). Slightly to moderately worn pale primary tips, and moult limits with less intense black (or browner) and looser juvenile greater coverts (if retained). Rest of plumage and amount of white on remiges generally as first-summer. **Juvenile** Very distinctive compared to juvenile *lugens* or *persica*, being generally smoky and browner overall, with grey-brown upperparts and dusky buff-brown underparts, often with darker or even blacker ear-coverts and bib, and warmer buff wing fringes (see Khoury *et al.* 2010).

### Appendix 2: summary of geographical variation in Mourning Wheatears of North Africa and the Middle East

Geographical variation in those members of the *O. lugens* complex breeding in North Africa and the Middle East (excluding southern Arabia) is marked. All the following taxa are consistently identifiable, with no



Figure 22. Distribution of the *Oenanthe lugens* complex in North Africa and the Middle East (excluding southern Arabia) (Magnus Ullman) showing breeding ranges and some movements, and with approximate boundaries between subspecies (broken lines). Considerably uncertainty and gaps in our knowledge exist meaning that some elements of the map should be viewed as tentative. Green = breeding; blue = wintering; arrows depict possible direction of migration by *O. l. persica*. The range of *O. l. warriae* is marked in red on the main map (enlarged at left) and is roughly based on the few published records, together with knowledge of its habitat requirements.

Notes. (1) Large '?' in Syria reflects the confusion surrounding which taxon breeds there; traditionally, this has been assumed to be *O. l. lugens*, but we have found evidence that *O. l. persica* occurs there, although its temporal status is unclear (see Future research). (2) Small '?' in eastern Lebanon: Porter & Aspinall (2010) indicated that the range of *O. l. lugens* covers most of Lebanon to the Mediterranean coast, but this seems erroneous (perhaps reflecting former confusion with Finsch's Wheatears *O. finschii*). However, in the drier areas of easternmost Lebanon, *lugens* could breed or occur in winter. (3) Arrows mark possible dispersal of *O. l. persica*, but only the Iranian population is known to be migratory, mostly to eastern Arabia. We have found evidence to suggest that *persica* winters west to Israel and Sinai (several specimens in Tel Aviv University Zoological Museum). It is unclear if these are from Iran (see note 1). (4) Border between *O. l. halophila* and *O. l. lugens* in Egypt remains to be elucidated. Extensive research in the area from the Nile to eastern Libya is needed, to elucidate whether intermediate populations of these two distinctive taxa exist as claimed.

documented evidence of possible overlap or interbreeding. For now, the four are conservatively maintained as subspecies, until such time as definitive evidence of specific status for some or all taxa becomes available. The following is based on specimens at BMNH, AMNH and the Tel Aviv University Zoological Museum, and summarises information prepared for Shirihai & Svensson (in press), Shirihai *et al.* (in prep.) and Roselaar & Shirihai (in prep.).

The most useful characters are the degree of sexual dimorphism, pattern and extent of white in the remiges, the extent of the buffy / rufous undertail-coverts, the size of the white rump, and the existence of polymorphism (only obvious in female *halophila*). To some degree the forms are also differentiated by biometrics and wing formula. See also Fig. 22 for further details concerning the distribution of each taxon.

*O. l. lugens* (eastern Egypt, north-west Saudi Arabia, Israel and Jordan, but the taxon in Syria requires further investigation—see Further research), like *O. l. persica* (but unlike *O. l. halophila*) both sexes are virtually identical and black and white; the pinkish-buff to rufous undertail-coverts and whitish wing panel are well developed. In adults, the white bases to the inner webs are broad and reach closer to the shafts, and the border with the dark fields less steeply angled (more step-like—on p2 and p3 closer to the shaft, at least 10 mm above primary-coverts), forming more solid white flashes (Fig. 17). However, considerable age-related variation exists, with first-years having, on average, narrower white bases that often do not reach close to the shafts and can even lack the step-like pattern, to the extent of appearing identical to *persica* in this respect. Females, of respective ages, have on average smaller areas of white, but variation renders this unreliable for sexing. Reliable separation of *lugens* vs. *persica* outside the breeding season / regions should hinge on the white wing pattern only in adult males and use other clues, e.g. tail-band width and wing length, as well as p1 in relation to the tips of the primary-coverts and p2 (see Table 1). Exposed white base to p1 rather extensive and usually well defined. Wing ♂ 94–98 mm ( $n = 10$ , mean 96.1), ♀ 89–94 mm ( $n = 6$ , mean 90.8); tail ♂ 61–68 mm ( $n = 7$ , mean 64.6), ♀ 58–62 mm ( $n = 4$ , mean 58.6); bill (both sexes) 17.6–19.7 mm ( $n = 25$ , mean 18.45).

*O. l. halophila* (Morocco to north-west Egypt, although permanent breeding range in north-west Egypt requires confirmation) is unique within the group in showing strong sexual dimorphism, with females being generally duller grey-brown (resembling female *O. finschii*), but males are black and white (for rare darker females, see below). Pinkish-buff undertail-coverts and whitish panel in wing strongly reduced compared to

*O. l. lugens*. Colour of undertail-coverts patch highly variable in both sexes, from pinkish white or cream-buff to pale orange / rufous-buff, whilst white flashes ragged, concentrated on secondaries and inner primaries, and narrower (on inner webs usually not reaching shafts). Wing ♂ 89–97 mm ( $n = 17$ , mean 91.8), ♀ 85–90 mm ( $n = 14$ , mean 87.8); tail ♂ 54–63 mm ( $n = 17$ , mean 57.9), ♀ 54–60 mm ( $n = 14$ , mean 56.5); bill (both sexes) 17.1–19.3 mm ( $n = 31$ , mean 18.3). Females can show a dark throat, and are highly variable in darkness of neck-sides and wings, with some extremely dark birds perhaps only sexed correctly by their greyish-brown back. Förschler *et al.* (2010) found rather low genetic divergence (0.2–1.0%) between nominate *lugens* and *halophila*, suggesting their retention together. Guichard (1955) reported that of four females collected in Tripolitania, Libya, one was typical pale *halophila*, but two others were principally male-like, while the fourth seemed intermediate between male and female plumage. Apparently similar intermediates reported from Egypt by Baha el Din & Baha el Din (2000), who also reported birds with *halophila*-like plumage but with extensive white in wing like *O. l. lugens*. However, neither of these references acknowledged the extreme variation in female *halophila* described above. Baha el Din & Baha el Din (2000) confirmed the lack of overlap in breeding ranges of *halophila* and *lugens* in Egypt, which are separated by the Nile (and even suggested that they favour different habitats). *O. l. halophila* is constant in its plumage characteristics and clear sexual differences exist across its range. Vocally, too, *halophila* and *lugens* clearly differ (Shirihai & Svensson in press).

*O. l. persica* (north-east Iraq and Iran) is essentially a migrant breeder, moving as far as south-west Arabia in winter, but is rather subtly differentiated from *lugens*, except by the following. Black tail-band broader, with width of black at shaft 14–23 mm, but mostly >17 mm (Table 1). White on bases of inner webs of remiges substantially reduced, narrow and pointed, separated very steeply from dark fields, with division on pp2–3 ending approximately in line with primary-coverts or well below this. Thus white bases never reach very close to shafts (or form ‘step-like’ pattern of *lugens*) on exposed primaries, and consequently also has much more ragged white flashes in flight. (Beware of some variation in *lugens*; see above.) White bases to rest of remiges reduced, short, or often greyer and ill defined, and exposed white base on p1 small, ill defined or lacking. The black ‘bib’ tends to appear broader and may extend further onto the upper breast, while in fresh plumage the cap is often more brownish (sometimes almost dusky or blackish brown), but there is extensive individual variation in both these. Undertail-coverts similar to *lugens* or paler rufous, but much variation and overlap. Overall larger with more pointed wing. Wing ♂ 89–98 mm ( $n = 12$ , mean 94.9), ♀ 88–98 mm ( $n = 11$ , mean 92.2); tail ♂ 59.5–65.0 mm ( $n = 12$ , mean 63.5), ♀ 57–64 mm ( $n = 11$ , mean 60.5); bill (both sexes) 17.2–20.6 mm ( $n = 23$ , mean 18.8).

*O. l. warriae* (north-east Jordan and southern Syria) is almost solely black above and below. The only white areas are rump, lower ventral region, upper- and undertail-coverts, and tail feathers except inverted blackish ‘T’. Latter pattern recalls previous two taxa, but subterminal band broad, approaching *persica* (14.5–19.0 mm wide along shaft of r6). Unlike any other member of the *lugens* complex it lacks rufous undertail-coverts, which are essentially white or tinged pale sandy cream, dusky white or pale greyish, probably due to soil discoloration. White rump patch very restricted, only  $\frac{2}{3}$  to  $\frac{1}{2}$  that of *lugens*, and only  $\frac{2}{3}$  that of *persica*. Strongly reduced white in bases to remiges, but pattern generally approaches that of *persica*. Only in adult males, which have most white, is the amount substantial and visible though still narrow and at most forms ragged flashes in flight. In young, especially females, the white is absent or nearly so, with a greyish translucence in some lights. Thus, even in adult male *warriae* the white areas are far narrower than in a young female *lugens* or than most *persica*. Wing more pointed, also approaching *persica*, including very short p1, which is dark greyish below (lacking white tip or basal area of other taxa). Virtually identical to male *O. picata opistholeuca* (especially young females with no visible white in wing) and often reliably separated only using wing structure and formula. Wing ♂ 97–99 mm ( $n = 3$ , mean 98.3), ♀ 92.0–92.5 mm ( $n = 3$ , mean 92.2); tail ♂ 64.5–65.0 mm ( $n = 3$ , mean 64.8), ♀ 62–65 mm ( $n = 3$ , mean 63.2); bill (both sexes) 18.0–19.5 mm ( $n = 6$ , mean 18.5).

### Appendix 3: *O. l. warriae* assessed under the Tobias *et al.* (2010) guidelines

Tobias *et al.* (2010) established transparent guidelines for assessing species rank under a modern version of the Biological Species Concept. Readers are referred to that paper in considering the following. Conservatively, measured against geographically proximate *O. l. lugens*, *O. l. warriae* might score for the black, rather than white, crown and belly (3), lack of buffish-coloured undertail-coverts (3), reduced white in the primaries and rump, but broader tail-band (2), different biometrics and wing formula (1), and habitat preferences (1), giving a total of ten points (i.e. above the threshold seven points considered necessary to assign species rank under the Tobias *et al.* 2010 system). This ignores potential differences in vocals, which remain to be accurately elucidated, and the possibility that *lugens* and *warriae* occur in parapatry, as this is also undetermined. For now, we can be sure only that *lugens* and *warriae* select different habitats and that inter-breeding must be unquestionably rare, given that there are no documented examples of mixed pairs between these two. Despite the results of this scoring, we have assigned *warriae* subspecies rank in light of the fact that the taxonomy of the *O. lugens* complex requires further clarification, and due to its previous treatment as a colour morph.